[0055] In the method for manufacturing the magnetoresistive-effect device including the step of laminating the insulator layer on the multilayer film, in the step of forming the electrode layer, the angle made between the surface of the protective layer or the surface of the multilayer film with the protective layer removed therefrom and the end face of the electrode layer extending over the insensitive region of the multilayer film is preferably 60 degrees or greater, and more preferably 90 degrees or greater.

[0056] The sensitive region of the multilayer film, measured through a micro track profile method, is defined as a region which results in an output equal to or greater than 50% of a maximum reproduction output while the insensitive regions of the multilayer film are defined as regions, formed on both sides of the sensitive region, which result in an output smaller than 50% of the maximum reproduction output, when a magnetoresistive-effect device having the electrode layers formed on hard bias layers only and not extending over the multilayer film scans a micro track, having a signal recorded thereon, in the direction of the track width.

[0057] In the method for manufacturing a magnetoresistive-effect device, the bias layers are preferably deposited on both sides of the multilayer film through at least one sputtering technique selected from an ion-beam sputtering method, a long-throw sputtering method, and a collimation sputtering method, with the substrate, having the multilayer film thereon, placed perpendicular to a target made of a composition of the bias layer, and the electrode layer is preferably deposited on the bias layer into an undercut formed in the underside of the resist layer arranged on the multilayer film through at least one sputtering technique selected from an ion beam sputtering method, a long-throw sputtering method, and a collimation sputtering method, with the substrate, having the multilayer film thereon, placed slightly oblique to a target made of a composition of the electrode layer, or with the target placed slightly oblique to the substrate.

[0058] Preferably, the multilayer film includes an antiferromagnetic layer, a pinned magnetic layer, a nonmagnetic electrically conductive layer, and a free magnetic layer, or the multilayer film includes a free magnetic layer, nonmagnetic electrically conductive layers respectively lying over and under the free magnetic layer, pinned magnetic layers respectively lying over the one nonmagnetic electrically conductive layer and under the other nonmagnetic electrically conductive layer, and antiferromagnetic layers respectively lying over the one pinned magnetic layer and under the other pinned magnetic layer, or the multilayer film includes a magnetoresistive-effect layer, a soft magnetic layer, and a nonmagnetic layer wherein the magnetoresistive-effect layer and the soft magnetic layer are laminated with the nonmagnetic layer interposed therebetween.

[0059] Preferably, the multilayer film includes at least one of each of an antiferromagnetic layer, a pinned magnetic layer, a nonmagnetic electrically conductive layer, and a free magnetic layer, or the multilayer film includes a free magnetic layer, nonmagnetic electrically conductive layers respectively lying over and under the free magnetic layer, pinned magnetic layers respectively lying over the one nonmagnetic electrically conductive layer and under the other nonmagnetic electrically conductive layer, and antiferromagnetic layers respectively lying over the one pinned magnetic layer and under the other pinned magnetic layer, or the multilayer film includes a magnetoresistive-effect layer, a soft magnetic layer, and a nonmagnetic layer wherein the magnetoresistive-effect layer and the soft magnetic layer are laminated with the nonmagnetic layer interposed therebetween.

[0060] The free magnetic layer preferably includes a plurality of soft magnetic thin films having different magnetic moments and nonmagnetic material layers, which are alternatively laminated with one soft magnetic thin film separated from another by one nonmagnetic material layer, and the free magnetic layer is in a ferrimagnetic state in which the magnetization directions of adjacent soft magnetic thin films, separated by the nonmagnetic material layer, are aligned antiparallel to each other.

[0061] When the free magnetic layer is fabricated by laminating the plurality of soft magnetic thin films having different magnetic moments and the nonmagnetic material layers with one nonmagnetic material layer interposed between adjacent soft magnetic thin films, the magnetic coupling junction between the multilayer film and the bias layer is preferably fabricated of an interface with the end face of only one of the plurality of the soft magnetic thin films forming the free magnetic layer, in the step of depositing the bias layer.

[0062] The pinned magnetic layer preferably includes a plurality of soft magnetic thin films having different magnetic moments and nonmagnetic material layers, which are alternately laminated with one soft magnetic thin film separated from another by one nonmagnetic material layer, and the pinned magnetic layer is in a ferrimagnetic state in which the magnetization directions of adjacent soft magnetic thin films, separated by the nonmagnetic material layer, are aligned antiparallel to each other.

[0063] The nonmagnetic material layer is preferably made of a material selected from the group consisting of Ru, Rh, Ir, Cr, Re, Cu, and alloys thereof.

[0064] In the step of depositing the bias layers, the position of at least one of the top edge and the bottom edge of the magnetic coupling junction between the multilayer film and the bias layer in the direction of the movement of a medium is preferably set to be at the same level as the position of at least one of the top surface and the bottom surface of the free magnetic layer or the magnetoresistive-effect layer in the direction of the movement of the medium.

[0065] The antiferromagnetic layer is preferably made of a PtMn alloy. Alternatively, the antiferromagnetic layer may be made of an X—Mn alloy where X is a material selected from the group consisting of Pd, Ir, Rh, Ru, and alloys thereof, or may be made of a Pt—Mn—X' alloy where X' is a material selected from the group consisting of Pd, Ir, Rh, Ru, Au, Ag, and alloys thereof.

[0066] Even if the width dimension of the top surface of the multilayer film, composed of the antiferromagnetic layer, the pinned magnetic layer, the nonmagnetic electrically conductive layer, and the free magnetic layer, is defined as a track width Tw, the full width of the multilayer film does not necessarily exhibit the magnetoresistive effect. Only the central portion of the width of the multilayer film offers an excellent reproduction gain, exhibiting the mag-